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(54) **ELECTROMAGNETIC TRACKING WITH AUGMENTED REALITY SYSTEMS**

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See application file for complete search history.

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(57) **ABSTRACT**

Head-mounted augmented reality (AR) devices can track pose of a wearer's head to provide a three-dimensional virtual representation of objects in the wearer's environment. An electromagnetic (EM) tracking system can track head or body pose. A handheld user input device can include an EM emitter that generates an EM field, and the head-mounted AR device can include an EM sensor that senses the EM field. EM information from the sensor can be analyzed to determine location and/or orientation of the sensor and thereby the wearer's pose. The EM emitter and sensor may utilize time division multiplexing (TDM) or dynamic frequency tuning to operate at multiple frequencies. Voltage gain control may be implemented in the transmitter, rather than the sensor, allowing smaller and lighter weight sensor designs. The EM sensor can implement noise cancellation to reduce the level of EM interference generated by nearby audio speakers.

13 Claims, 54 Drawing Sheets